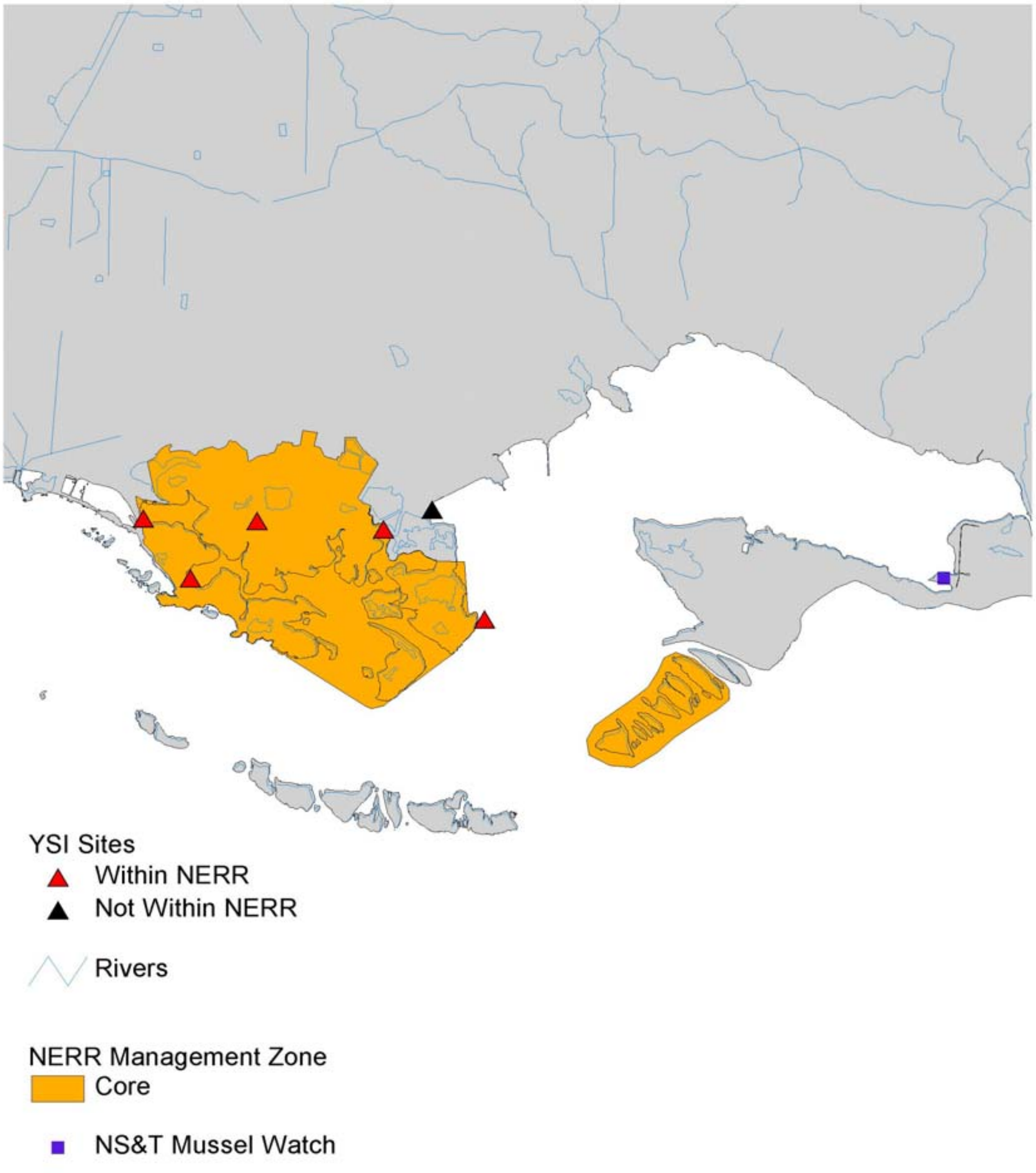
Jobos Bay



YSI Sites
Within NERR
Not Within NERR
Rivers
NERR Management Zone
Core
NS&T Mussel Watch

Jobos Bay, Station 9 (JOB09)

Characterization (Latitude = 17° 56' 37 " N; Longitude = 66° 14' 19" W)
Tides in Jobos Bay are diurnal and range from 0.30 m to 0.36 m. The lagoon is 0.26 km long (mainstream linear dimension) with an average depth of 1 m MHW and an average width of 115 m. At the sampling site, the depth is 1 m MHW and the width is 60 m. This site is located on a mangrove channel, where no main streams are found. Groundwater infiltrates into the sea and is the main source of fresh water. Creek bottom habitats are predominantly silt-clay, with no bottom vegetation. The dominant marsh vegetation near the sampling site is red mangrove. Upland land use near the sampling site includes a power plant and, further upland, a landfill and poultry processing plant. Activities that potentially impact the site include runoff from old deposits of dredge material. This sampling station is subject to runoff and potential spills contamination from the Electric Power Thermoelectric Plant. Station nine was historically used as a disposal site for the residues from a now defunct sugar mill operation, which might have been a high source of organic matter into the sediments.

Descriptive Statistics
Thirty-four deployments were made at this site between Jan-Dec 1996, Mar, Apr, Jun, and Nov 1997, and Apr-Jun, Aug, and Oct-Nov 1998 (Figure 165). Mean deployment duration was 14.5 days. Seven deployments (Aug 1996; Jun 1997; May, Jun, Aug, and Oct 1998) were less than 10 days.

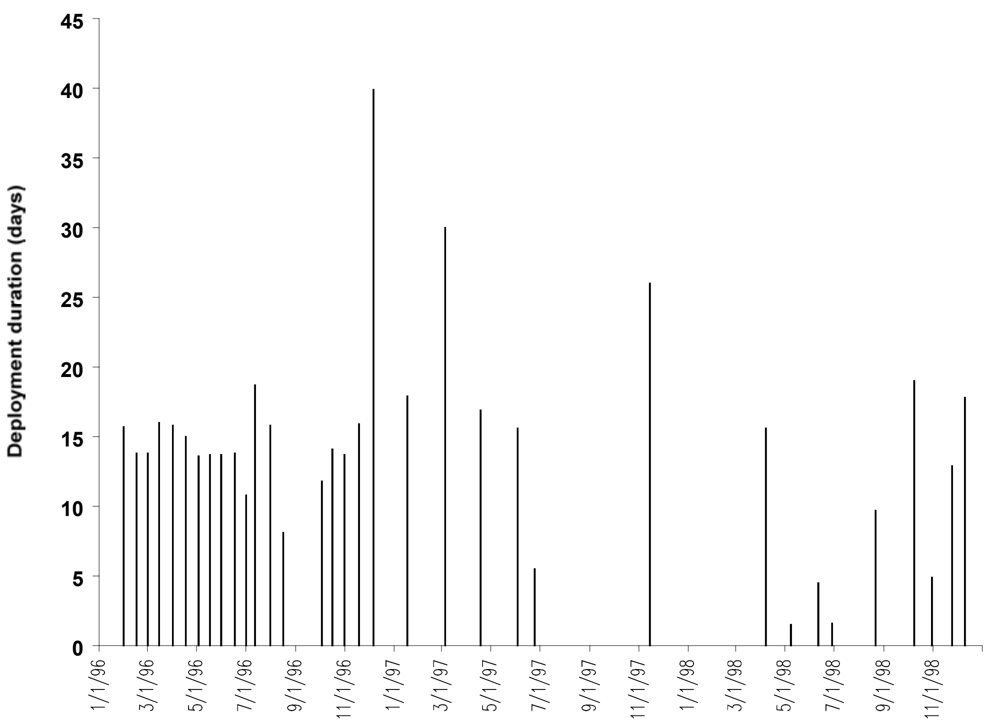


Figure 165. Jobos Bay, Station 9 deployments (1996-1998).

Forty-eight percent of annual depth data were included in analyses (85% in 1996, 34% in 1997, and 24% in 1998). Sensors were deployed at a mean depth of 0.5 m below the water surface and 0.3 m above the bottom sediment. Minor fluctuations (0.2-0.4 m) were observed from scatter plots throughout the data set, except for Jan 1997 when fluctuations approached 0.8 m. Harmonic regression analysis attributed 54% of depth variance to interaction between 12.42 hour and 24 hour cycles, 44% of depth variance to 24 hour cycles, and 2% of depth variance to 12.42 hour cycles.

Forty-eight percent of annual water temperature data were included in analyses (85% in 1996, 34% in 1997, and 24% in 1998). Water temperature followed a seasonal cycle; however, magnitude of mean annual water temperature fluctuation was < 5°C (Figure 166). Mean water temperature was 30-31°C in summer and 26-27°C in winter. Minimum and maximum water temperatures between 1996 and 1998 were 20.9°C (Oct 1998) and 35.4°C (Jun 1998), respectively. Scatter plots suggest daily and bi-weekly fluctuations in water temperatures equivalent to annual variation in mean water temperature. Harmonic regression analysis attributed 84% of temperature variance to 24 hour cycles, 15% of temperature variance interaction between 12.42 hour and 24 hour cycles, and 1% of temperature variance to 12.42 hour cycles.

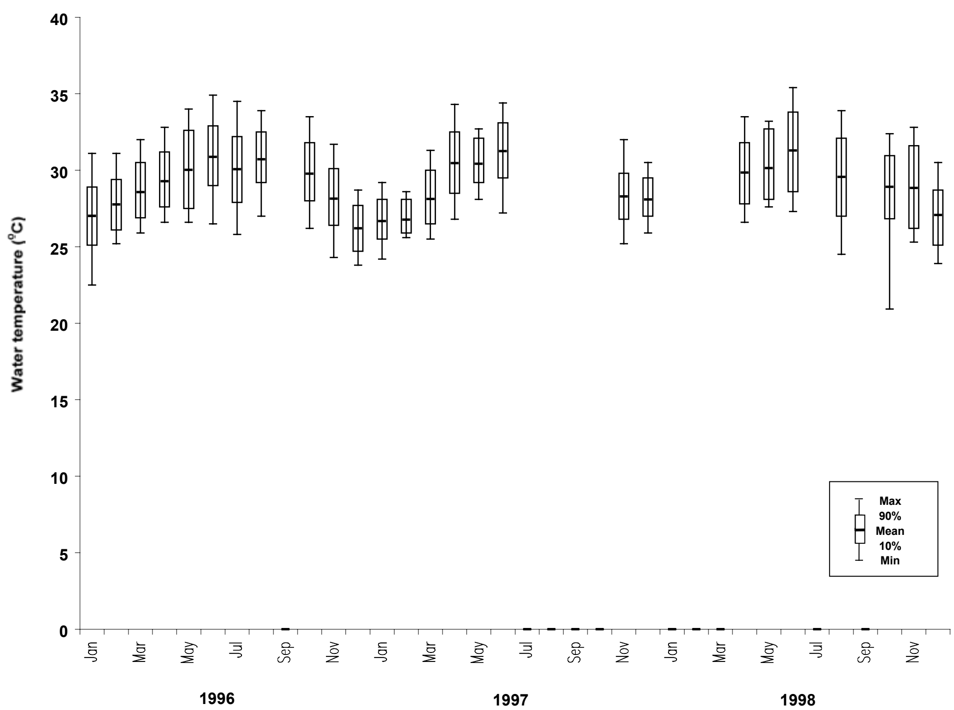


Figure 166. Water temperature statistics for Jobos Bay, Station 9, 1996-1998.

Forty percent of annual salinity records were included in analyses (80% in 1996, 24% in 1997, and 15% in 1998). Salinity followed a weak seasonal cycle, with greatest mean salinity (38-40 ppt) in spring and 35-36 ppt the rest of the year (Figure 167). Mean salinity was greater in 1998 (38-43 ppt, with 52 ppt recorded in May) than in 1996-1997. Minimum and maximum salinity between 1996-1998 was 22.7 ppt (Dec 1996) and 53.8 ppt (May 1998), respectively. Scatter plots suggest minor fluctuations in daily salinity and bi-weekly salinity equivalent to annual variation in mean salinity. Harmonic regression analysis attributed 52% of salinity variance to interaction between 12.42 hour and 24 hour cycles, 42% of variance to 24 hour cycles, and 6% of variance to 12.42 hour cycles.

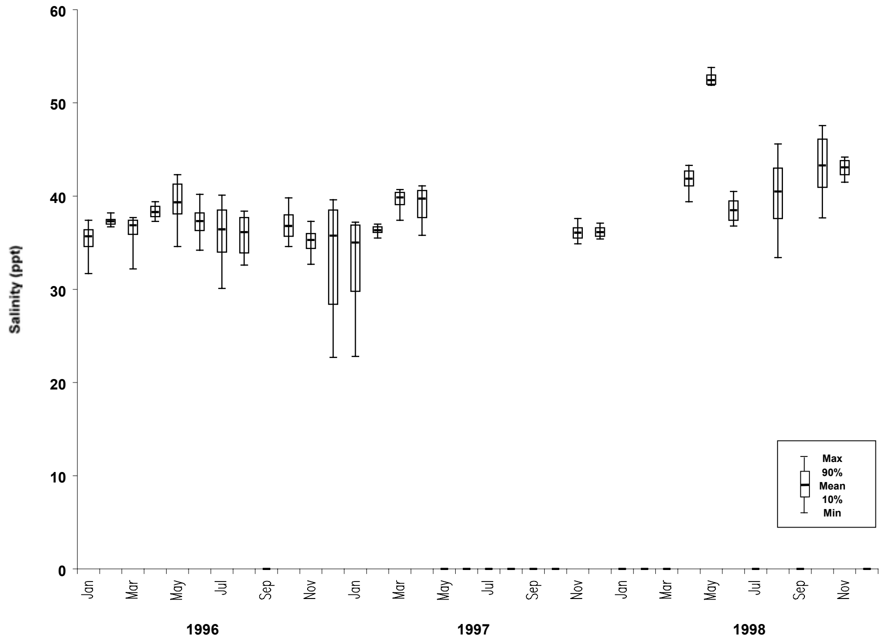


Figure 167. Salinity statistics for Jobos Bay, Station 9, 1996-1998.

Twenty-eight percent of annual dissolved oxygen (% saturation) data were included in analyses (65% in 1996 and 9% in 1997 and 1998). Mean DO was typically 55-85% saturation throughout the data set. Mean DO below 50% saturation was observed on four occasions (May, Aug 1996 and Jan, Nov 1997). Mean DO above 100% saturation was observed on three occasions (Oct 1996 and Jun, Dec 1998). Hypoxia was frequently observed, primarily in spring/summer 1996. When present, hypoxia persisted for 31% of the first 48 hours post-deployment on average (Figure 168). Supersaturation was frequently observed, primarily in 1998. When present, supersaturation persisted for 28% of the first 48 hours post-deployment on average. Scatter plots suggest very strong fluctuations (≥ 80%) in percent saturation at both daily and bi-weekly intervals. Harmonic regression analysis attributed 61% of DO variance to 24 hour cycles, 34% of DO variance to interaction between 12.42 hour and 24 hour cycles, and 5% of DO variance to 12.42 hour cycles.

Photosynthesis/Respiration

Almost all (97%) of the data used to calculate the metabolic rates fit the basic assumption of the method (heterogeneity of water masses moving past the sensor) and were used to estimate net production, gross production, total respiration and net ecosystem metabolism (Table 32). Instrument drift during the duration of the deployments was not a significant problem at this site. Total respiration greatly exceeded gross production at Station 9; thus, the net ecosystem metabolism and P/R ratio indicated that this is a very heterotrophic site (Figure 169). Temperature was significantly ($p<0.05$) correlated with gross production, total respiration and net ecosystem metabolism. Gross production and respiration increased as temperature increased, while net ecosystem metabolism became more heterotrophic as temperature increased. Salinity was significantly ($p<0.05$) correlated with gross production, total respiration and net ecosystem metabolism. Gross production and respiration increased as salinity increased, while net ecosystem metabolism became more heterotrophic as salinity increased.

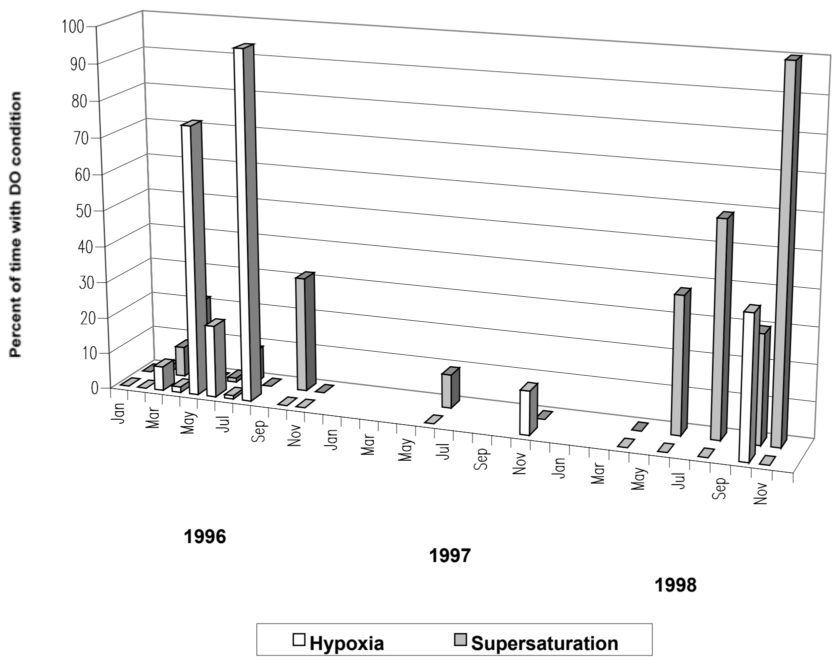


Figure 168. Dissolved oxygen extremes at Jobos Bay, Station 9, 1996-1998.

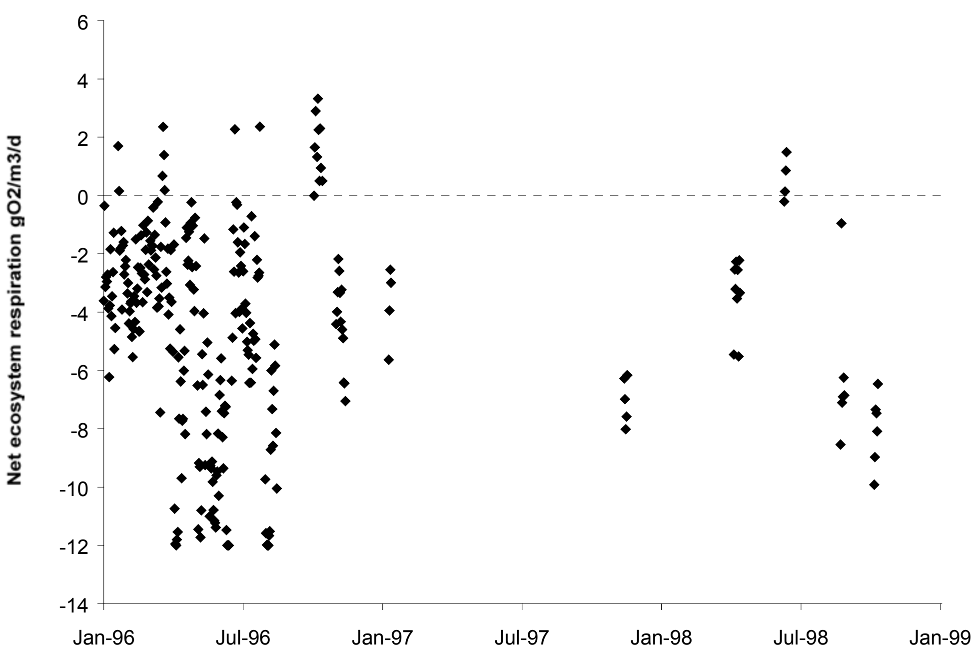


Figure 169. Net metabolism at Jobos Bay, Station 9, 1996-1998.

Table 32. Summary of metabolism data and statistics at Jobos Bay, Station 9, 1996-1998.

Station 9	mean	s.e.
Water depth (m)	1.0	
Net production gO_2/m3/d	0.33	0.16
Gross production gO_2/m3/d	5.63	0.19
Total respiration gO_2/m3/d	10.16	0.26
Net ecosystem metabolism g O_2/m3/d	-4.52	0.22
Net ecosystem metabolism g C/m2/y	-426	
P/R	0.55	
Statistical results		
Drift – paired t-test		
Gross production	ns	
Total respiration	ns	
Net ecosystem metabolism	ns	
Percent useable observations	97 %	
Paired t-test on gross production and total respiration	$p < 0.001$	
Correlation coefficient	Temperature	Salinity
Gross production	0.30	0.14
Total respiration	0.41	0.31
Net ecosystem metabolism	-0.23	-0.25

Jobos Bay, Station 10 (JOB10)

Characterization (Latitude = 17°56' 20" N; Longitude = 66°15' 27" W)
Tides in Jobos Bay are diurnal and range from 0.30 m to 0.36 m. The lagoon is 0.434 km long (mainstream linear dimension) with an average depth of 1.5 m MHW. At the sampling site, the depth is 1.5 m MHW and the width is 196 m. Creek bottom habitats are predominantly sandy silt-clay, with small patches of *Thalassia testudinum* (seagrass). The dominant marsh vegetation near the sampling site is red mangrove. The upland area is a salt flat with mangroves, white sand beach and *Thalassia* beds west of the site. Jobos Bay is un-impacted by human activities.

Descriptive Statistics
Twenty-nine deployments were made at this site between Feb-Dec 1996, Apr-May and Nov-Dec 1997, and Jan, Jun-Aug, Oct, Dec 1998 (Figure 170). Mean deployment duration was 14.1 days. Five deployments (Nov 1996, 1997; Jun-Aug 1998) were less than 10 days, one of which (Jun 1998) was less than one day.

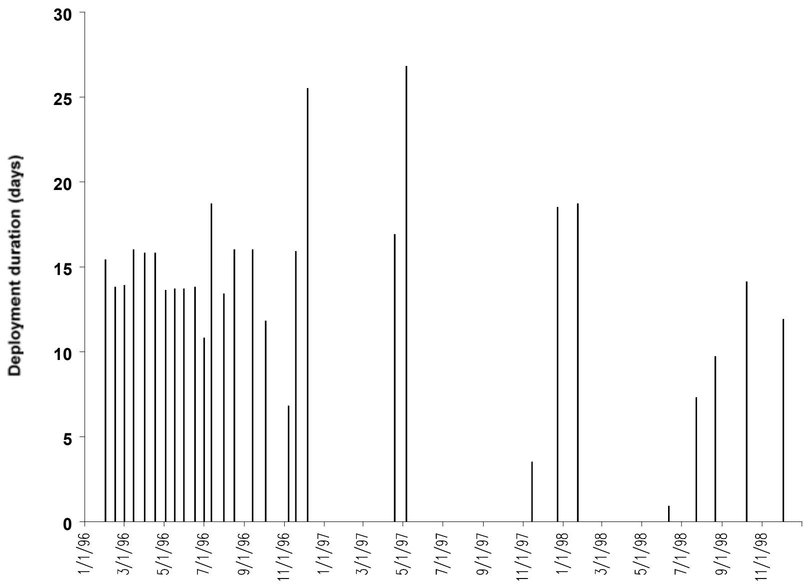


Figure 170. Jobos Bay, Station 10 deployments (1996-1998).

Thirty-seven percent of annual depth data were included in analyses (77% in 1996, 15% in 1997, and 20% in 1998). Sensors were deployed at a mean depth of 0.7 m below the water surface and 0.3 m above the bottom sediment. Minor fluctuations (0.2-0.4 m) in daily and bi-weekly depth were evident from scatter plots, except for Dec 1998 when moderate (0.7 m) fluctuations were observed. Harmonic regression analysis attributed 60% of depth variance to interaction between 12.42 hour and 24 hour cycles, 39% of variance to 24 hour cycles, and 1% of variance to 12.42 hour cycles.

Thirty-seven percent of annual water temperature data were included in analyses (77% in 1996, 15% in 1997, and 20% in 1998). Water temperature followed a seasonal cycle; however, magnitude of mean annual water temperature fluctuation was <5°C (Figure 171). Mean water temperature was 30-31°C in summer and 26-28°C in spring and fall. Minimum and maximum water temperatures between 1996 and 1998 were 24.7°C (Jan 1998) and 33.4°C (May 1996), respectively. Scatter plots suggest daily and bi-weekly fluctuations in water temperatures equivalent to annual variation in mean water temperature. Harmonic regression analysis attributed 92% of temperature variance to 24 hour cycles, 7% of temperature variance to interaction between 12.42 hour and 24 hour cycles, and 1% of temperature variance to 12.42 hour cycles.

Twenty-eight percent of annual salinity data were included in analyses (77% in 1996, 1% in 1997, and 6% in 1998). In 1996, mean salinity followed a weak seasonal cycle, with greatest mean salinity (39 ppt) in spring and least mean salinity (30-35 ppt) in summer (Figure 172). Observations of salinity were too limited in 1997-1998 to describe seasonal patterns. Minimum and maximum salinity between 1996-1998 were 16.7 ppt (Sep 1996) and 42.8 ppt (Oct 1998), respectively. Scatter plots suggest minor (<1 ppt) variance in daily salinity, with stronger (1-3 ppt) variance in bi-weekly salinity. During episodic events (Jul, Sep 1996), salinity fluctuated by ≤ 10 ppt. Harmonic regression analysis attributed 54% of salinity variance to 24 hour cycles, 35% of salinity variance to interaction between 12.42 hour and 24 hour cycles, and 11% of salinity variance to 12.42 hour cycles.

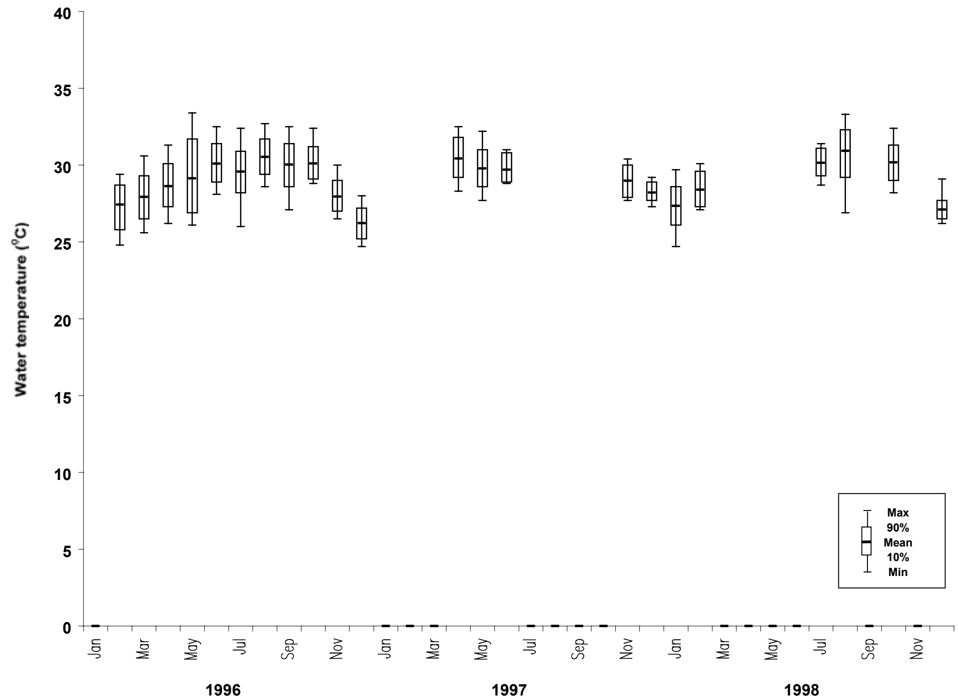


Figure 171. Water temperature statistics for Jobos Bay, Station 10, 1996-1998.

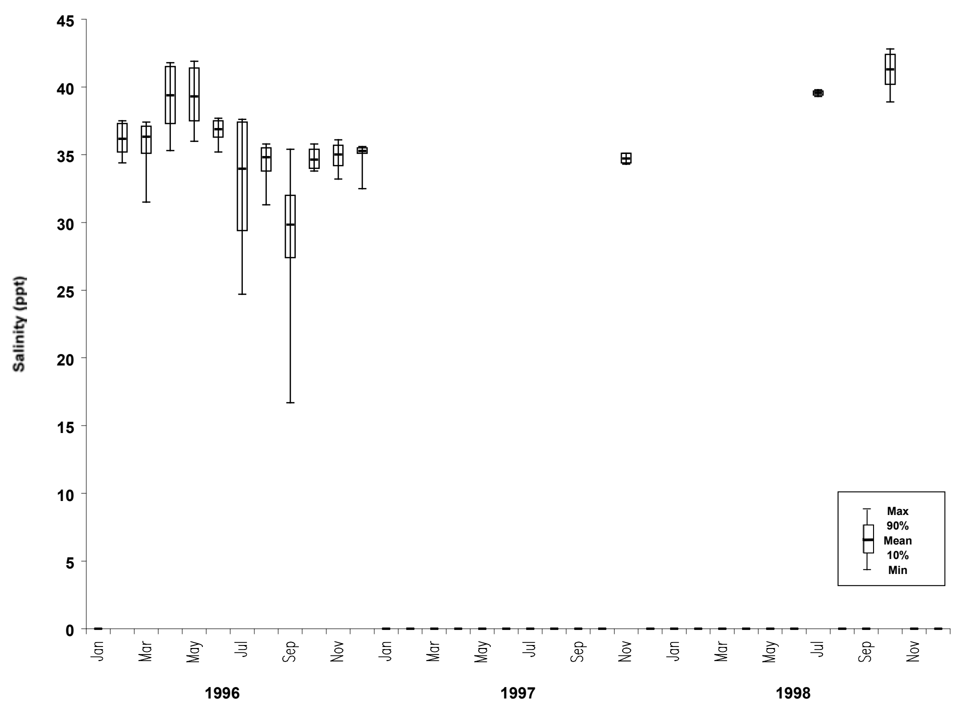


Figure 172. Salinity statistics for Jobos Bay, Station 10, 1996-1998.

Thirty-two percent of annual dissolved oxygen (% saturation) data were included in analyses (75% in 1996, 12% in 1997, and 11% in 1998). Mean DO was typically 60-100% saturation throughout the data set. Mean DO below 50% saturation was observed on two occasions (Oct 1996, Nov 1998). Mean DO above 100% saturation was observed on three occasions (Jul 1996 and Feb, Oct 1998). Minimum and maximum DO between 1996-1998 was 0% saturation (Sep-Oct 1996) and 498% saturation (Feb 1998), respectively. Hypoxia was observed in two months (Sep, Oct 1996) and persisted for 37% and 2% of the first 48 hours post-deployment, respectively (Figure 173). Supersaturation was frequently observed in 1996 and 1997, but never observed in 1998. When present, supersaturation persisted for 16% of the first 48 hours post-deployment on average. Scatter plots suggest moderate fluctuations (40-80%) in percent saturation at both daily and bi-weekly intervals throughout most of the data set. Harmonic regression analysis attributed 50% of DO variance to interaction between 12.42 hour and 24 hour cycles, 46% of DO variance to 24 hour cycles, and 4% of DO variance to 12.42 hour cycles.

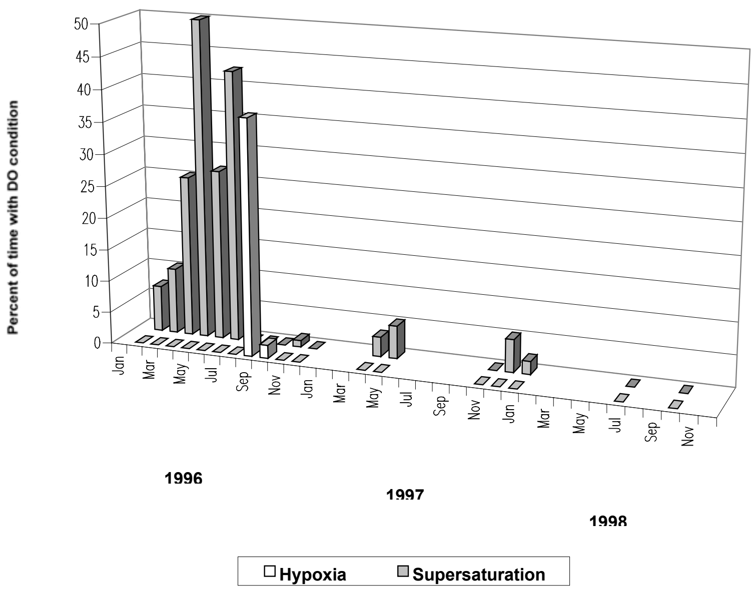


Figure 173. Dissolved oxygen extremes at Jobos Bay, Station 10, 1996-1998.

Photosynthesis/Respiration

Nearly all (94%) of the data used to calculate the metabolic rates fit the basic assumption of the method (heterogeneity of water masses moving past the sensor) and were used to estimate net production, gross production, total respiration and net ecosystem metabolism (Table 33). Instrument drift during the duration of the deployments was not a significant problem at this site. Total respiration exceeded gross production at Station 10; thus, the net ecosystem metabolism and P/R ratio indicated that this is a heterotrophic site (Figure 174). Temperature was significantly ($p<0.05$) correlated with gross production and total respiration, but not net ecosystem metabolism. Gross production and respiration increased as temperature increased. Salinity was significantly ($p<0.05$) correlated with respiration and net ecosystem metabolism. Respiration decreased as salinity increased, while net ecosystem metabolism became more autotrophic as salinity increased.

Table 33. Summary of metabolism data and statistics at Jobos Bay, Station 10, 1996-1998.

Station 10	mean	s.e.
Water depth (m)	1.5	
Net production gO_2/m3/d	0.83	0.11
Gross production gO_2/m3/d	3.23	0.10
Total respiration gO_2/m3/d	4.50	0.12
Net ecosystem metabolism g O_2/m3/d	-1.28	0.11
Net ecosystem metabolism g C/m2/y	-95	
P/R	0.72	
Statistical results		
Drift – paired t-test		
Gross production	ns	
Total respiration	ns	
Net ecosystem metabolism	ns	
Percent useable observations	94 %	
Paired t-test on gross production and total respiration	$p < 0.001$	
Correlation coefficient	Temperature	Salinity
Gross production	0.22	ns
Total respiration	0.21	-0.20
Net ecosystem metabolism	ns	0.21

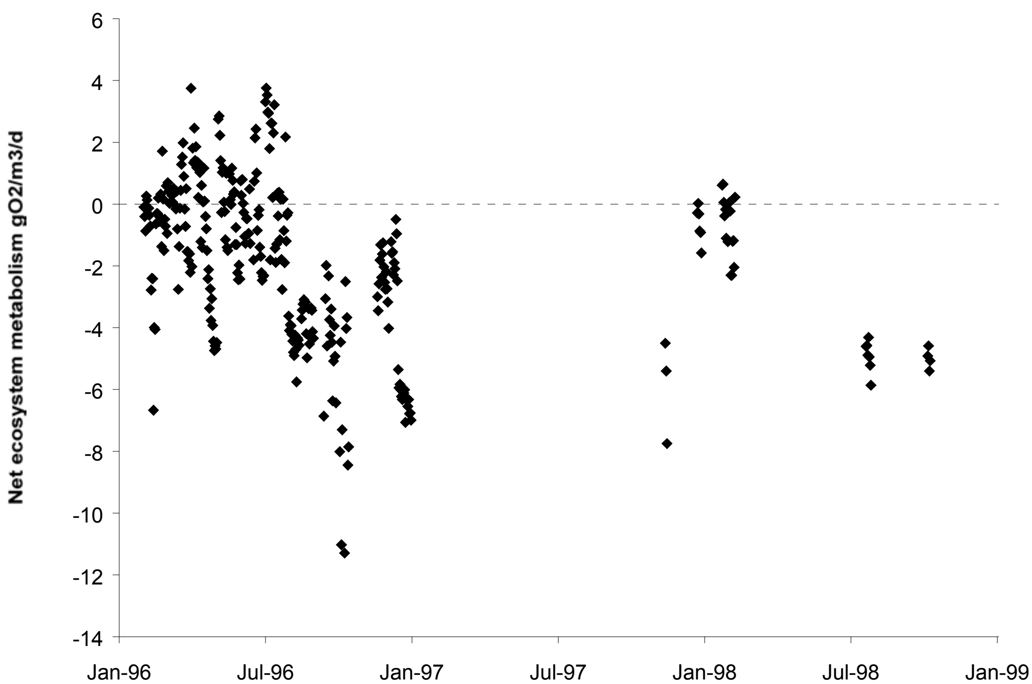


Figure 174. Net metabolism at Jobos Bay, Station 10, 1996-1998.